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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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Remarks at Opening Ceremonies
"Man In Space" Exhibit
American Museum of Natural History
New York, New York

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Administrator
National Aeronautics and Space Administration

PRESIDENT WHITE, LADIES AND GENTLEMEN:

It is a great pleasure to be here to open this Man in Space Exhibition. The occasion marks a significant milestone, for it was here on October 12, 1951, ten years ago tomorrow, that the American Museum of Natural History was host to the first symposium on space travel ever held in the United States.

In this ten years, our country and the world have moved into an entirely new era of thought and action. In 1951, the conquest of space by man was still a dream. Sounding rockets, primitively instrumented and guided, were the only probes we had sent into the vast unknown surrounding the earth. They returned only the simplest of data.

In the four years since space flight was first demonstrated, man has made and sent devices into space which orbit the earth and reach out to the sun and planets to radio back immeasureable additions to our store of knowledge. He has also sent the first of his fellow beings into space and brought them back safely.

This hall, which houses the Man in Space Exhibit, was given by the State of New York as a memorial to Theodore Roosevelt. It was dedicated by Franklin Delano Roosevelt. These two great presidents, of different political parties, each had a zest for exploring the unknown, and a deep faith that men, working through their governments, as well as other institutions for cooperative action, could effectively overcome the problems of their time. Both would certainly join wholeheartedly today, could they be here, in wishing every success to the bold enterprise which this exhibition portrays -- that of insuring that the United States of America is first in space science and technology.

When you examine the exhibit here, you will see that the exploration of space is a step-by-step process. Such problems as weightlessness, radiation, extreme heat and cold, and the stresses of acceleration and vibration to which spacecraft are subjected when they fly in space and exit and return through the earth's atmosphere at enormous speeds are no longer fearsome unknowns. But we still have much to learn about them in our struggle to master manned space flight. As you will see in this exhibit, new technology in energy use, in electronics and communications, in new materials and in life support systems is the foundation for our efforts to enable man to carry with him an operable environment into the hostile realm of space. It is not enough to survive. Man is going into space to do useful work in the cause of all mankind, and the conditions required for useful work in space are formidable indeed.

In the past ten years this Museum, through its Department of Astronomy, the American Museum Hayden Planetarium, has sponsored other symposia, exhibitions, and educational programs in the space sciences. This has been done to develop general awareness of the importance of space exploration and to create an informed public prepared to participate wisely in national space decisions.

We at the National Aeronautics and Space Administration are, of course, delighted to see such an exhibit as the one surrounding you, which is concerned almost entirely with the biological problems of manned space flight. The National Museum of Natural History deserves the highest praise for its continued interest in this field.

In considering the importance of the most advanced technology to manned space exploration, and the use of men in the discovery and analysis of the forces of nature at work in the vast areas beyond the earth's atmosphere, a nice balance must be struck between the means used to attain velocities upward to 25,000 miles per hour, the accelerations and other forces tolerable by man, and the invention of protective and adaptive means to accomplish the seemingly impossible.

Rocket systems can permit only 5 to ten percent of their weight in structure. They require 90 to 95 percent in fuel. Every additional pound in a low earth orbit costs ten pounds in the booster system. Every pound boosted to the surface of the moon requires more than 150 pounds of fuel and structure in the rocket to provide the added thrust to escape the earth's gravity. Boosting man into space enclosed within an environment that allows useful work stretches to the limit practically every technology our scientists and engineers have developed.

Every item of equipment you will see today will prove our ingenuity in advanced technology and will also speak eloquently of the tremendous rate of change that is taking place in every field.

When we turn from technology to man himself, we recognize immediately that we cannot re-engineer the human being. Man cannot be tailored to fit space exploration. He must have oxygen to breathe, be provided pressure similar to that on earth, as well as temperature and humidity that he can tolerate. Provision must also be made for elimination of carbon dioxide and other toxic agents. He must be protected from radiation and other hazards. He must learn to live with weightlessness, or we must find a way to counteract it. Psychologically he must conquer such factors as isolation, confinement, detachment, the threat to life, and even the contemplation of never returning to earth.

In short, the whole area of the life sciences, the study of man himself, must be married effectively to the most advanced work we are doing in the physical sciences and in technology.

The National Aeronautics and Space Administration has two Man in Space programs. They are Project Mercury and Project Apollo.

Project Mercury is designed to put a manned satellite in orbit at an altitude of more than 100 miles, circle the earth three times, and then bring it back safely. As most of you know, two manned suborbital flights carrying Astronauts Alan Shepard and Virgil Grissom have already been made. The first manned orbital flight is planned for late this year or early in 1962.

Project Mercury was designed to tell us how man will react to spaceflight, how he can perform in a space environment, and what should be provided in future manned spacecraft to allow him to function usefully. Equally important, of course, is the technical knowledge which Project Mercury will give us about the design, construction, and operation of the first U. S. vehicle specifically engineered for manned spaceflight.

From the viewpoint of the astrobiologist, the flights of Shepard and Grissom were intensely interesting, although of short duration, each about 15 minutes. During these 15 minutes both Shepard and Grissom carried out in the spacecraft the tasks that were assigned to them, including attitude control and correction and deceleration rocket firing.

Each was subjected to about five minutes of weightlessness and found this no handicap in performance of duties.

Each endured, without harmful results, gravity forces six times his own weight due to the accelerations of rocket launch, and eleven times his own weight due to entry decelerations. Both were in constant voice communication with the ground.

The physiological reactions of both men before, during, and after the flight, did not materially differ from reactions shown during earlier ground tests.

The second step in the NASA manned space program is Project Apollo, designed to lead ultimately to a three-man expedition to the moon. Apollo will require space techniques far in advance of those needed for Mercury. Apollo must be built to withstand a much greater launch thrust. It must be capable of guidance toward the moon and it must be able to land gently on the moon, then be launched from the moon and guided back for safe return into the earth's atmosphere at the fantastic speed of 25,000 miles per hour.

The Atlas booster for the Mercury launching produces some 360,000 pounds of thrust. The launch vehicle for Apollo must develop 30 to 50 times as much. Apollo will require self-contained power systems for course correction, landing on the moon, for the launch back to earth, and for a controlled landing on the earth.

Like other achievements in space, the Apollo flights must be a step-by-step process. The spacecraft will first be flown in orbit around the earth so that the many components and systems of the vehicle can be tested and evaluated.

These earth-orbiting flights will also be used for training the space crew and for development of operational techniques. Each will also include important scientific experiments.

As the competence of the Apollo vehicle and the men who will operate it increases, the flights will go farther and farther from earth, and will be of longer duration and complexity. A major step will be a manned flight around the moon, on which the crew will perform many of the guidance and control tasks that will be needed later on in the lunar landing mission.

In constructing Apollo, a modular concept will be used. That is, the spacecraft will be divided into compartments or units, each designed as a complete subsystem to accomplish a complete function.

The first compartment will be the "command center module." It will house the crew during launch and entry and serve as a flight control center for the remainder of the mission.

The second module is a propulsion unit. It will be capable of making mid-course corrections, of putting the spacecraft into whatever orbit the mission calls for, and of providing the power needed for the return flight of a lunar mission.

In an advanced version of Apollo, a third module will be an additional propulsion stage to decelerate the spacecraft as it approaches the moon and lower it gently to the moon's surface. On other missions this module, or perhaps even an additional section, would serve as a laboratory for various space experiments.

The launch vehicle for Apollo's earth orbit and circumlunar flights will be Saturn, while a giant clustered booster called Nova -- which will develop 12 million or more pounds of thrust -- is planned for the lunar landing flight.

No launching schedule has been established for a manned lunar landing. However, President Kennedy has stressed his view that "this Nation should commit itself to achieving the goal, before the decade is out, of landing a man on the moon and returning him safely to earth." How much sooner we will be able to accomplish this cannot be determined just now. We are going to proceed toward the goal as rapidly as possible. As soon as we can make the attempt, we will.

There is no doubt that dramatic and important space achievements which demonstrate a very advanced capability in science and technology have a tremendous impact on world opinion. This is an important consideration in our program and we are increasing our efforts to acquire a space capability second to none.

However, this is by no means the only consideration. Included in NASA's 10-year program goals are: (1) exploration of space to gain scientific knowledge; (2) practical applications of advances in space technology for the benefit of the people of our country and those of other nations; (3) advancement of technology on a broad front to meet the diverse requirements in the fields of aeronautics and space; (4) development of launch vehicles, spacecraft, supporting technology and facilities to meet future needs for manned and unmanned space exploration; (5) cooperation with and support of other Government agencies whose functions and responsibilities relate to those of NASA; (6) cooperation with other nations in the exploration of space.

Since January 31, 1958, this country has successfully launched 52 earth satellites, two solar satellites, and two deep space probes. These have furnished a wealth of information to science and to our knowledge of the requirements for manned space flight.

NASA's Echo I passive communications satellite, launched in 1960, has been seen by millions of people throughout the world. The huge, aluminized plastic sphere proved that it is possible to communicate between distant areas on the earth by reflecting radio signals from a satellite.

NASA's TIROS series of meteorological satellites has demonstrated the possibilities of vastly more accurate and longer-range weather forecasting. TIROS I transmitted nearly 23,000 television pictures of the earth's cloud patterns. TIROS II, launched last November, has transmitted more than 40,000 pictures and has reported important information about the atmosphere and the radiation of solar heat back from the earth.

TIROS III pictures of Storm Eliza in the Pacific and Hurricanes Esther, Anna, and Carla on the Atlantic and Gulf Coasts were valuable aids to the Weather Bureau in tracking these cyclonic winds and issuing warnings. NASA also used TIROS III for weather support of Astronaut Grissom's July 21 Mercury suborbital flight.

Advanced launch vehicles are becoming available to us for both scientific missions and for operational systems. They will have greatly improved load-carrying capability for the unmanned space experiments which must precede extensive manned flights. Good examples are the programs for Ranger which will land instruments on the moon, and Surveyor, a spacecraft that will be able to make a so-called "soft landing" on the moon with more delicate scientific instruments. Also under development are spacecraft that will fly close to Venus and Mars.

Already the national investment in space exploration has produced new materials, metals, alloys, fabrics, and compounds which have gone into commercial production. From work in space vacuum and extreme temperatures have come new durable, unbreakable plastics and new types of glass that will have a wide variety of uses.

Medical scientists in the space effort have devised minute sensors to gauge an astronaut's physical responses, to measure his heartbeat, brain waves, blood pressure, and breathing rate. These same devices are now being attached to hospital patients so that their conditions can be recorded continuously and automatically at the desk of a head nurse.

More than 3,200 space-related products have been developed in the United States. They come from the 5,000 companies and research outfits now engaged in missile and space work. From this new industry are coming new opportunities and new jobs.

For Fiscal Year 1962, the National Aeronautics and Space Administration has a budget of $1,671,750,000. This includes $245,000,000 for construction of new and supporting facilities and $1,220,000,000 for research and development. Eighty percent of the NASA research and development budget is spent through contracts with industry and private organizations.

The large sums of money required in this effort are not spent in space or on the moon. They are spent in the nation's factories, workshops, and laboratories for salaries, materials, and supplies.

In the time available today, I can only touch the highlights of space exploration, which has been termed "the most challenging adventure man has ever undertaken."

I do want to mention, however, a long-term aspect of the national program that is one of the logical following steps to the theme of the Man in Space exhibit which you will be viewing here today. This is the prospect that we may eventually discover that life is not a phenomenon unique to our planet.

NASA has several projects under way to discover if life, in whatever high or lowly form, may have evolved elsewhere in our solar system. For example, Stanford University's School of Medicine is developing instruments for detecting signs of life on other planets. This equipment will be installed in unmanned devices that we shall in the foreseeable future be landing on the surfaces of Mars and Venus.

Many scientists believe that the odds favor the existence of life beyond that on earth. At any rate, we have begun research that will ultimately go far to answer this question. It is within the realm of possibility that, a decade or so from now, the exhibit in this great hall of the American Museum of Natural History may be called, not Man in Space, but Life in Space.

The United States program in space offers us the chance for unparalleled progress. I am convinced that, as a nation, we shall respond boldly and with determination to the call President Kennedy issued when he urged the world:

"To invoke the wonders of science instead of its terrors . . . to explore the stars, to conquer the deserts, eradicate disease, tap the ocean depths and encourage the arts and commerce."

Thank you very much.

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